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Evaluation of phytoextracts for the management of garlic (*Allium sativum* L.) bulbs fungal pathogens

N.M.Ghangaonkar
Department of Botany, C.T.Bora College Shirur (Ghodnadi),Pune (MS), INDIA
nghanu@gmail.com

ABSTRACT:
For studying the biocontrol of garlic (*Allium sativum* L.) bulb fungal pathogens, total thirty 10% aqueous leaf extracts from different plants were tested against eight main bulb deteriorating fungi associated with soft neck garlic varieties like silver white and silver rose. In general all the leaf extracts proved to be inhibitory more or less to the growth of fungi. In particular *Botrytis alli* was significantly inhibited by leaf extract of *Vinca rosea* similarly, *Macrophomina phaseolina* growth was suppressed by *Rananculus asiaticus, phyllanthus emblica* and *Adathoda zeyalanica.* The plants like *Callistemon rigidus,Lantana camera,*and *Asparagus racemosus* were proved inhibitory to *Stemphyllum botryosum* and *Penicillium notatum.* The growth of *Alternaria porri, Penicillium notatum* and *Macrophomina phaseolina* could be controlled by leaf extracts of *Caoetropis procera* and *ocmium sanctum.* Only *Tinospora cordifolia* can inhibit growth of *Cladosporium alli.* Some fungi show resistance to leaf extracts and do not get affected much by it. *Botrytis alli* and *Macropomina phaseolina* do not show inhibition due to *Parthenium hysterophorus* and *vinca rosea* respectively and *Azadirachta indica* do not have impact on *Fusarium oxysporum* and *Stemphyllium botryosum*. In the same way *Alternaria porri* and *Aspergillus niger* were least affected by *Euphobia hirta* and *Tagetes erecta* respectively.

Key words: Biocontrol, garlic, fungal pathogens, leaf extracts

INTRODUCTION

Garlic (*Allium sativum* L) is most important bulb crop grown in India. Crops in genera and bulbs in particular get associated with various fungal pathogens both in fields and storages. The bulbs due to handling, cultivation practices and ill storages are infected severely by number of fungi.

Due to association of these fungi it has also been found that bulbs are significantly damaged and destroyed resulting in bulb rot, necrosis, etc.Various fungicides have been tested to control the fungal diseases of garlic but, indiscriminate use of these fungicides may lead to various hazards. To avoid problems created by chemicals, attempts have been made to have biological control over garlic fungal pathogens *in vitro* by using phytoextracts. From literature it is clear that various plants are known to have antifungal properties and these can be used as promising biocontrol agents [1-10]. In all 8 fungal pathogens were isolated from garlic bulbs and tested against 30 leaf extracts of different angiospermic plants. The pathogens were isolated from soft neck garlic varieties like silver white and silver rose.

MATERIALS AND METHODS

For studying the efficacy of leaf extracts against garlic bulb fungi Poisoned food technique [11] was used. In all thirty phytoextracts were used from different plants which were obtained by grinding 10 gm. Freshly collected leaves with 100ml. of distilled water and filtering through the double layered Muslin cloth. It was diluted to 10% concentration with distilled water. In this method a Luke warm PDA which was sterilized at 15lbs. for 20min. was taken and requisite quantity of plant extract was added to get 1:1 final concentration (PDA:plant extract) . The plant extracts were thoroughly mixed with PDA by stirring. The 20 ml. of this medium was poured in presterilised petridishes. After solidification small discs (0.7cm) of the fungal culture grown on PDA plates for 7 days was cut with sterile cork borer and transferred aseptically in the centre of Petridishes containing 1:1 Medium. Suitable checks were kept where the culture disks were grown on PDA plates without plant extracts. The fungal colony diameter compared with control was taken as measure of fungitoxicity.

From the table it is clear that all the thirty leaf extracts from different plants proved to be inhibitory more or less to the garlic bulb fungi. In particular *Botrytis alli* was significantly inhibited by leaf extract of *vinca rosea* and least inhibited by *Withania somnifera*. Similarly *Macrophomina phaseolina* growth was controlled by *Rananculus asiaticus, Phyllanthus emblica* and *Adathoda zeyalanica* and least controlled by *Vinca rosea*. *Stemphyllium botrysum* and *Pennicillium notatum* get more affected by plant extracts of *Callestemon rigidus,Lantana camera ,Asparagus racemosus and Acalypha indica* where as *Azadirachta indica* could not affect their growth. *Calotropis prosera* and *ocmium sanctum* were proved inhibitory to *Alternaria porri., Pennicillium notatum and Macrophomina phaseolina*.in the same way *Acalypha indica* proved effective to control growth of *Cladosporium alli.* Some fungi showed resistance to some plant leaf extracts like *Alternaria porri* and *Aspergillus niger* were not affected by *Euphorbia hirta* and *Tagetes erecta* respectively. Similarly, *Azadirachta indica* was less effective to *Fusarium oxysporum,* and *Stemphylium botryosum.*

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RESULTS AND DISCUSSION

Table I: Effect of phytoextracts on growth of garlic bulb fungal pathogens

Plant extracts	Fungal pathogens							
	ALP	ASN	FUO	STB	BOA	PES	MAP	CLA
	Diameter of fungal growth (mm)							
Vinca Rosea	30 (52.3)	57 (24.0)	43 (38.5)	36 (38.9)	20 (60.7)	32 (51.5)	44 (27.8)	26 (51.8)
Parthenium hysterophorus	38 (39.6)	50 (33.3)	35 (50.0)	29 (50.8)	36 (29.4)	34 (48.4)	38 (37.7)	30 (38.8)
Solanum nigrun	38 (39.6)	44 (41.3)	43 (38.5)	34 (42.3)	26 (49.0)	41 (37.8)	32 (47.5)	33 (38.8)
Rananculus asiaticus	24 (61.9)	37 (50.6)	44 (37.1)	36 (38.9)	27 (47.0)	41 (37.8)	25 (59.0)	34 (37.0)
Callistemon rigidus	27 (57.1)	50 (33.3)	48 (31.4)	22 (62.7)	26 (49.0)	25 (62.1)	39 (36.0)	34 (37.0)
Azadirachta indica	44 (30.1)	51 (32.0)	50 (28.5)	43 (27.1)	26 (49.0)	41 (37.8)	39 (36.0)	29 (46.3)
Calotropis procera	24 (61.9)	46 (38.6)	35 (50.1)	33 (44.0)	26 (49.9)	41 (37.8)	24 (60.6)	28 (48.1)
Datura Alba	26 (58.7)	38 (49.3)	40 (42.8)	36 (38.9)	31 (39.2)	39 (40.9)	31 (49.9)	29 (46.3)
Ocmium sanctum	25 (60.3)	32 (57.3)	36 (48.5)	31 (47.4)	26 (49.0)	27 (59.0)	27 (55.7)	23 (57.4)
Polyalthia longifolia	36 (42.8)	39 (48.0)	49 (30.0)	34 (42.3)	21 (58.8)	31 (53.0)	28 (54.1)	27 (50.0)
Withania somnifera	30 (52.3)	45 (40.0)	40 (42.8)	40 (32.2)	36 (29.4)	33 (50.0)	34 (44.2)	28 (48.1)
Acalypha indica	44 (30.1)	44 (41.3)	47 (32.8)	31 (47.4)	26 (49.0)	27 (59.0)	32 (47.5)	23 (57.4)
Tinospora cordifolia	30 (52/3)	43 (42.6)	32 (54.2)	30 (49.1)	36 (29.4)	41 (37.8)	30 (50.8)	22 (59.2)
Catharanthus roseus	39 (38.1)	46 (38.6)	35 (50.0)	28 (52.5)	30 (41.1)	34 (48.4)	31 (49.1)	31 (42.5)
Phyllanthus emblica	33 (47.6)	36 (52.0)	33 (52.8)	36 (38.9)	22 (56.8)	34 (48.4)	25 (59.0)	23 (57.4)
Vitex negundo	33 (47.6)	31 (58.6)	32 (54.2)	25 (57.6)	24 (52.9)	37 (43.9)	35 (42.6)	31 (42.5)
Euphorbia hirta	45 (28.5)	52 (30.6)	40 (42.8)	32 (45.7)	21 (58.8)	33 (50.0)	35 (42.6)	30 (44.4)
Prosopis juliflora	36 (42.8)	37 (50.6)	33 (52.8)	42 (28.8)	37 (27.4)	32 (51.5)	28 (54.1)	33 (38.8)
Lantana camera	32 (49.2)	34 (54.6)	32 (54.2)	23 (61.0)	26 (49.0)	23 (65.1)	28 (54.4)	23 (57.4)
Lawosonia inermis	28 (55.5)	47 (44.4)	48 (31.4)	28 (52.5)	25 (50.9)	41 (37.8)	25 (59.0)	33 (38.8)
Ficus religiosa	30 (52.3)	38 (49.3)	44 (37.1)	33 (44.0)	29 (43.1)	33 (50.0)	28 (54.1)	23 (57.4)
Curcuma longa	30 (52.3)	50 (33.3)	40 (42.8)	30 (49.1)	23 (54.9)	41 (37.8)	31 (49.1)	24 (55.5)
Santalum album	33 (47.6)	43 (42.6)	43 (38.5)	29 (50.8)	24 (52.9)	41 (37.8)	30 (50.8)	23 (57.4)
Adathoda zeylanica	36 (42.8)	38 (49.3)	44 (37.1)	33 (44.0)	25 (50.9)	38 (42.8)	29 (52.4)	22 (59.2)
Eucalyptus globulus	32 (49.2)	33 (56.0)	43 (38.5)	32 (45.7)	35 (31.3)	34 (48.4)	34 (44.2)	33 (38.8)
Argyreia nervosa	29 (53.9)	40 (46.6)	44 (37.1)	31 (47.4)	32 (37.2)	34 (48.4)	31 (49.1)	31 (42.5)
Asparagus recemosus	32 (49.2)	43 (42.6)	43 (38.5)	24 (59.3)	24 (52.9)	35 (46.9)	32 (47.5)	31 (42.5)
Tagetes erecta	33 (47.6)	53 (29.3)	35 (50.0)	29 (50.8)	25 (50.9)	37 (43.0)	41 (327)	28 (48.1)
Clerodendrum aculeatum	43 (31.7)	46 (38.6)	32 (54.2)	27 (54.2)	24 (52.9)	33 50.0)	27 (55.7)	28 (48.1)
Aloe Vera	36 (42.8)	43 (42.6)	44 (37.1)	31 (47.4)	29 (43.1)	38 (42.8)	29 (52.4)	23 (57.4)
Control	63	75	70	59	51	66	61	54

(Figures in the parenthesis indicate percent inhibition over control)

ALP—Alternaria porri, *ASN—Aspergillus niger,* FUO—*Fusarium oxysporum,* STB—*Stemphylium botryosum,*
BOA—Botrytis alli, *PES—Penicillium sp.,* *MAP—Macrophomina phaseolina,* *CLA—Cladosporium alli*

The plants tested in present studies against the garlic bulb fungal pathogens were proved inhibitory which was previously investigated by different workers as, inhibitory nature of *Polyalthia longifolia* against *Fusarium oxysporium* and *Aspergillus nige* was proved [10]. It was also fungitoxic to *Altrnaria sp*.[12] .The antifungal nature of *Tinospora cordifolia* against *Aspergillus sp*.was proved significantly[9]. The growth of *Aspergillus niger* and *Cladosporium alli* can be controlled by leaf extracts of *Solamum nigrum* [13]. *Pongamia pinnata* was proved as antifungal for *Alternaria alternata* [10].and *Fusarium oxysporum* . The efficacy of *Vitex negundo, Withania somnifera* was tested against *Penicillium sp.* and Study reveals that its effect is antifungal and can be used for controlling the tested fungi [5]. Same plant was found to be antifungal for *Fusarium oxysporum* and *Alternaria alternate*[14]. The plant *Vitex negundo* can be used to control the growth of *Alternaria alternata* [6]. All these studies carried out different workers on evaluating the efficacy of different plants against different fungi shows resemblance with present studies.

CONCLUSION

From results it is concluded that antifungal nature of leaf extracts of different plants like, *Vinca rosea, ranunculus asiaticus, phyllanthus emblica, Adathoda zeyalanica, callistemon rigidus, Lantana camera, Asparagus recemosus, Calotropis procera, Ocmium sanctum* and *Acalypha indica* against garlic bulb fungal pathogens is proved and can be used for controlling them as plants are eco-friendly and do not cause environmental hazards.

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